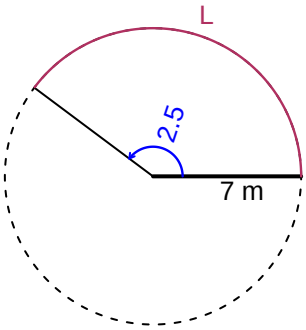
Name: Date:

Trig Final (SLTN v651)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 7 meters. The angle measure is 2.5 radians. How long is the arc in meters?

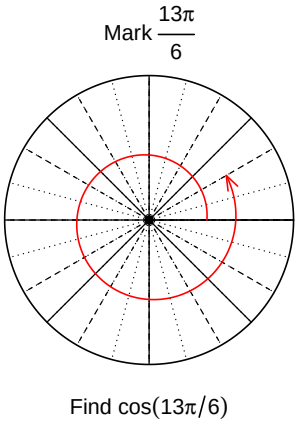


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

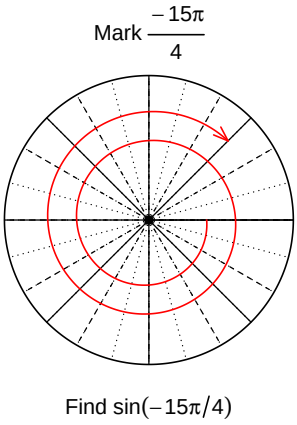
$L = 17.5$ meters.

Question 2

Consider angles $\frac{13\pi}{6}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{6}\right)$ and $\sin\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(13\pi/6)$



Find $\sin(-15\pi/4)$

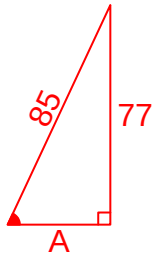
$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-77}{85}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

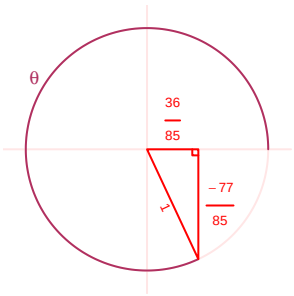
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 77^2 = 85^2$$
$$A = \sqrt{85^2 - 77^2}$$
$$A = 36$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{36}{85}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.02$ meters, a frequency of 2.44 Hz, and an amplitude of 5.14 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.14\sin(2\pi 2.44t) + 7.02$$

or

$$y = 5.14\sin(4.88\pi t) + 7.02$$

or

$$y = 5.14\sin(15.33t) + 7.02$$